

Semiannual Status Report on  
"Investigations into the Mechanism and Rates of  
Atmospheric Mixing in the Lower Thermosphere"  
Grant No. NGR 44-004-026  
March 15, 1966

The theoretical study of small amplitude (i.e., linear) gravity waves has been completed and a paper on this subject is almost ready for publication. The next phase of the gravity-wave study will be to attempt to determine the effect of non-linearities. These might give rise to atmospheric mixing that would not be described as eddy mixing; i.e., it would be mixing of a non-turbulent nature.

Attention is being given to the nature of turbulent motions and the degree to which stability can inhibit the vertical components of motion. Although there has not been any positive accomplishment in this area, it seems reasonable to expect that some useful conclusions can be reached for motions in the buoyancy subrange of the turbulence spectrum.

Calculations have been made of the vertical distribution of both major and minor atmospheric constituents in the lower thermosphere for various values of the eddy diffusion coefficient, but with no large-scale patterns of vertical motion. A computing program has been devised during recent months to include the effects of large-scale vertical motions; while the program now appears effective, no conclusions have yet been drawn. A variety of patterns of vertical motion will be introduced in an attempt to gain insight into the physical problem of large-scale circulation in the atmosphere.

The following papers have been published under this grant:

F. D. Colegrove, F. S. Johnson, and W. B. Hanson, "Atmospheric Composition in the Lower,"  
J. Geophys. Res., 1966.

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F. S. Johnson, "Density of an Exosphere," to be published in Ann. Geophys., 1966.

The following paper has been presented at a scientific meeting in connection with this grant:

F. S. Johnson, F. C. Colegrove, and W. B. Hanson, "Turbopause Processes and Effects," presented at the Second Conference on Direct Aeronomic Measurements in the Lower Ionosphere, University of Illinois, Urbana, Illinois, September 27-30, 1965.